the conversation between Edward and John is ended, they each hang up their telephones and press upon the

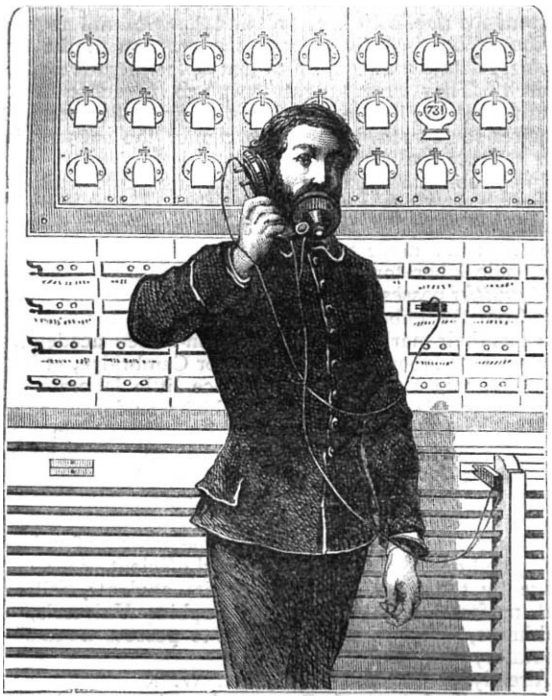

FIG. 2.—Switchman corresponding with a subscriber

knobs, when the number of each is again exposed at the central post. The *employé* then knows that the conversation between the two subscribers is ended; he raises

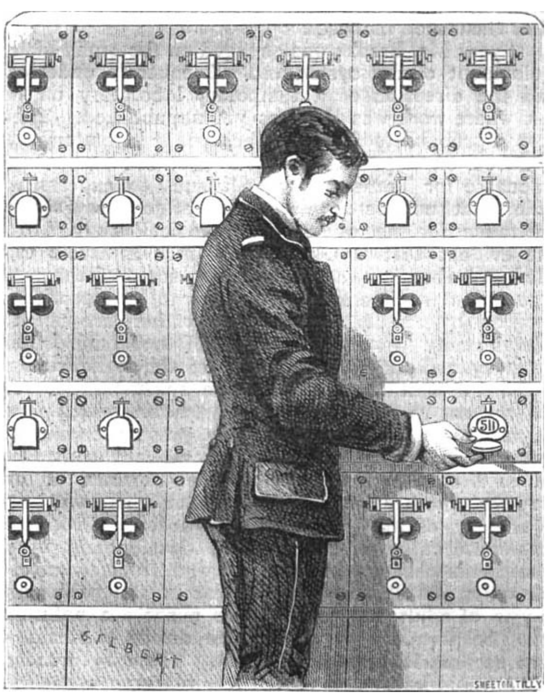

FIG. 3.—Another *employe* raising the warning signal.

the door, suppresses communication between Edward and John, and all is ready for a new call.

In posts where there are 500 or 600 subscribers the numbers are arranged in order on tables containing each 500 to 100 doors; special arrangements are then employed to bring the series into communication with each other. At New York the central office makes not less than 6,000 communications daily, and everything is conducted to the complete satisfaction of the subscribers. The telephone has become for them as indispensable as the omnibus or hansom for London. Every month a list of subscribers is distributed from the central office. The Chicago list already forms a small volume. The Ameri-

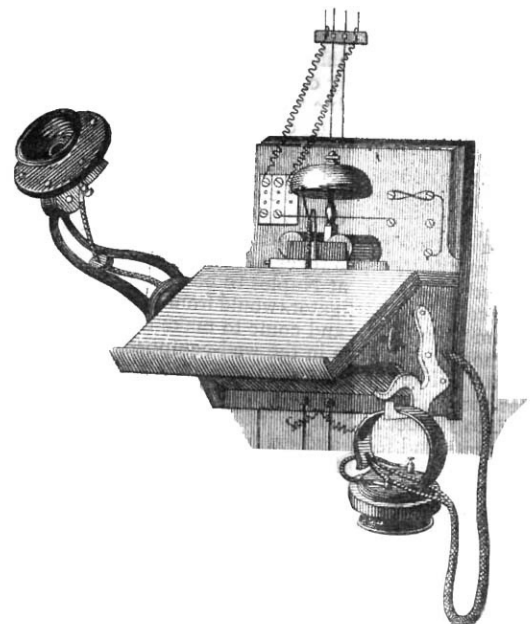

FIG. 4.—Telephone fitted up in a subscriber's office at New York.

can District Telegraph Company has greatly extended its services, and informs its subscribers that in three minutes after they call a liveried servant will be at their doors to distribute notes, circulars, &c., carry parcels, accompany a lady or a child to any place desired, or go for them, carry umbrellas to the children at school on a wet day, fetch the doctor, a cab, &c., &c., at any hour. We believe a beginning has been made in London of this invaluable means of communication; we trust that some arrangement will be come to with the Post Office authorities that will permit of its becoming universal. Its advantages are patent.

AN AMERICAN SEA-SIDE LABORATORY

THERE are some persons who, in their enthusiasm for doing a good thing, are led to mistake the name for the deed and to make as much fuss and general congratulation over an utterly inadequate representation of the good thing aimed at as would only be justified by the accomplishment of the good thing itself. One would have no special remark to offer on such curious self-deception, were it not that very frequently harm is done in connection with it in consequence of the enthusiastic individuals deceiving not only themselves but the public. Thus a worthy object is liable to be shelved or put aside from public attention on the ground that it has been accomplished, when really there has been only the most ridiculous pretence (consisting in the use of empty words), of attaining a long-desired and important end. Not only this, but such shams having once passed currently for the real things, the name of which has been

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delusively assigned to them, and subsequently having proved to be failures and wind-bags, the real worthy object in the name of which they have been paraded, suffers. It is only too readily accepted by the unbelieving Philistine that such-and-such a scheme has been tried and has proved to be a failure, when in reality only a puffed-up substitute, and not the scheme in question, has ever had a chance.

The term "zoological station" is suggestive of these remarks. The term was introduced by Dr. Anton Dohrn when about to establish at Naples a large aquarium connected with a series of laboratories, worked by a permanent staff of scientific observers and of fishermen and other attendants. Dr. Dohrn had a very clear notion of what he meant by a "zoological station," and has shown what that notion was by carrying it fully into effect, devoting thereto indomitable will and untiring energy. Dr. Dohrn's notion of a zoological station was an institution which should play somewhat the same part in zoology as the State astronomical observatories do in astronomy. A favourable locality was to be chosen, a building erected with all appliances for observation, and a staff of workers employed in making observations. A special feature in these "stations" was, however, anticipated, and has proved in the working of that at Naples to be a practical feature, viz., that capable investigators would from time to time leave their home-avocations and come to make observations for a few months at a time in the well-equipped well-located "station." The total cost of erecting and fitting the Naples zoological station cannot have been less than from 12,000*l.* to 15,000*l.*, whilst its income derived from various endowments and fees, and expended upon its maintenance and in the salaries of its officials is not less than 3,000*l.* a year.

That any enthusiastic young person who may unfold his umbrella on the sea-shore and contemplate under its shadow the starfish washed to his feet—should say that he has "opened a zoological station" may be strictly true so far as the etymology of the words "zoological" and "station" respectively is concerned; but it is at the same time a misleading announcement, and likely to do more harm than good to the cause of zoological stations.

There is no need to call a little sea-side laboratory by the pompous title which gains its connotation from Dr. Dohrn's magnificent institution on the Mediterranean shore, and it is a very satisfactory thing that such laboratories, open under certain conditions to naturalists who wish to make use of them, are coming into existence. At Concarneau, on the Brittany coast, the French Government had started a laboratory (under M. Coste) even before Dr. Dohrn's enterprise at Naples; M. de Lacaze Duthiers has since established a small laboratory at Roscoff, and the Austrian Government has constructed a laboratory and aquariums at Trieste which may one day rival those of Naples in extent and completeness

Soon after Dr. Dohrn's institution had been set going, a liberal American offered to the late Prof. Agassiz the island of Pennikese as a site for a "zoological station." The attempt was forthwith made to make bricks without straw; a class of students were landed on Pennikese, and after a sort of holiday pic-nic of some weeks, returned home. No money was forthcoming to build the necessary laboratories and to maintain the necessary staff of scientific and other employes, so the Pennikese "station" was quietly and very wisely dropped. Mr. Alexander Agassiz has since constructed for himself (and described in NATURE) a private laboratory on the coast where he carries on his own admirable researches, and can receive three or four other naturalists, and give them working-room. This is no doubt the reasonable thing to do, supposing a limited sum of money is at command. It is of no use to proclaim in the absence of abundant straw that you are about to start a fine brick-field; you must either abandon the business altogether or be content to make a quiet little heap with the aid of what straw you have at command.

These things cannot be done without money, and at present the public in England and America will not subscribe so handsomely towards the erection of the first zoological station as they do to that of the fifty thousandth church. They were taught long ago to subscribe to church-building by the example of states and princes. It requires some such initiation to render the subscription lists of zoological stations popular.

In the absence of paternal governments and intelligent princes, where can zoologists look for the supply of the funds necessary to start zoological stations, necessary even for more modest institutions which may be called "sea-side laboratories"? Assuredly it is the business of *Universities* possessing some disposable funds and as yet free from the imbecility which Government commissions leave as their mark upon commission-ridden academies, to start such laboratories. Oxford or Cambridge, or both together, might support a very nice little laboratory at Guernsey, or Falmouth, or Arran, which would be managed by a resident director, and continually frequented in vacation time by the advanced students of the Universities, as well as by other naturalists from all parts of the country. It seems, however, improbable that such a laboratory will be *immediately* started by either Oxford or Cambridge. It is probable that the newest of universities, and one of the most active and efficient, if we may judge by the work produced by its students, fellows, and professors, viz., the Johns Hopkins University of Baltimore, U.S.A., will be the first to possess a sea-side laboratory of its own.

Already in the year 1878, Mr. W. K. Brooks, now assistant Professor of Comparative Anatomy in the University, was charged with the superintendence of a summer class in a temporary laboratory at Chesapeake. The scientific results of this session have been published by Mr. Brooks, and include some good observations by students of the University, besides his own—the more interesting notices relating to the development of Lingula and of Gastropod molluscs.

Last year Mr. Brooks was engaged on the study of the development of the oyster, and subsequently undertook again the direction of a temporary laboratory on the coast where work was done as yet unpublished. There is now a probability that the Chesapeake laboratory may be placed on a permanent footing, and it is, perhaps, pardonable for Transatlantic colleagues to express the opinion that such a step would be one of great and serious importance for the welfare of zoological study. It is quite evident that at Chesapeake there is access to a varied and abundant fauna, including some of the most interesting of marine forms, some not to be met with in European waters. It is also clear that there are capable students ready to avail themselves of the facilities of a laboratory, and energy and talent of the right kind to keep the institution at work. The spasmodic descent upon the sea-coast in a summer vacation, which is all that many a naturalist can, under present conditions, afford, is a very delightful thing, and may sometimes lead to the collection of a few new species of one group or another: but it is not in this way that the zoology of to-day can be forwarded. Protracted and minute study of the steps of development of all organisms is what is now necessary, and, similarly, careful observation at all times of the year of the habits and changes of adult forms. For this purpose a naturalist should be permanently (at any rate during a portion of his career) resident upon the coast. There is, further, a more obvious advantage and a very real one in the conditions of a permanent sea-side laboratory. The locality becomes *thoroughly well known* to the naturalists who frequent it; the accumulated knowledge is handed on from year to year, until at last what were regarded as

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the rarest or most out-of-the-way animals can be fished up at five minutes' notice, and the time of appearance of this or that form, of the eggs of another, of the larvæ of another, is so precisely ascertained that the zoologist can go—not in his present hap-hazard fashion, to study anything which may turn up—but definitely primed and prepared to settle an important question in relation to a form which he is sure to obtain.

These advantages, and the honour of being the first University to possess a sea-side laboratory of its own, cannot be secured by the Johns Hopkins University without a certain definite outlay of money. What may be the cost of buildings and of permanently employing a fisherman, two attendants, and a scientific director in the United States, it is difficult to guess, but nothing less than an expenditure of 5,000*l.* on the building and an annual outlay of 700*l.* would give such an experiment a fair chance of success in this country.

E. RAY LANKESTER

THE SOLUBILITY OF GASES IN SOLIDS

MESSRS. HANNAY and Hogarth recently communicated to the Royal Society an important paper on the Solubility of Solids in Gases. The subject, an outline of which was given to our readers in an abstract of a preliminary paper by the same authors a few weeks ago, has attracted the more notice since it led Mr. Hannay to the research upon the artificial production of crystallised carbon, which is associated with his name.

The original purpose of Messrs. Hannay and Hogarth in undertaking this research was to investigate the condition of gases at their "critical point" with respect to their solvent power. For if at the critical point there really occurs a transition from liquid to gaseous state, and if the property of solids is one possessed by liquids alone, there ought to be precipitation of the dissolved solid matter as the substance passes through the critical point. If no such precipitation occurred, this would furnish an independent proof of the perfect continuity of the liquid and gaseous states, in addition to the proofs derived from the observed relations of temperature and pressure, and from the inability of optical tests to discriminate between gas and liquid in the condition of matter raised above its critical temperature.

A simple qualitative experiment was therefore undertaken as a preliminary test of the matter. "A solution of potassic iodide in alcohol was prepared, and a strong tube filled to about one-half with the solution. After sealing the tube was placed in an air-bath, and heat applied. No precipitation of solid could be seen even at a temperature of 350° C., more than 100° C. above the critical point of alcohol." A solution of resin in paraffin spirit showed no trace of decomposition at 360° C. under similar conditions.

To permit of experimenting under more exact conditions, a modification of Andrews's apparatus was devised, which, from its simplicity and efficiency deserves mention. A T-tube of wrought-iron of $\frac{1}{2}$-inch internal and 1-inch external diameter was furnished with wrought-iron screw caps. Through one of these the pressure-screw works; through the opposite end the experimental tube is fixed. The side-branch, about 3 inches long, admitted an air-manometer. The apparatus, which was less than 12 inches in length, was filled with mercury. The device for packing consisted in the employment of stout india-rubber plugs. Where the pressure-screw passed through the rubber the latter was protected by a greased leather lining. When high pressures were employed the tube was cemented in with oxychloride of zinc. This extremely simple method of packing was so perfect as to give freedom of motion without leakage even at the enormous pressure of 880 atmospheres.

With this apparatus it was demonstrated that a clean crystal of potassic iodide dissolved gradually away in pure alcohol gas (the term *gas* referring, as Andrews suggested, to the fluid, at any temperature *above* its critical point). Bromide of potassium, and chloride of calcium were also found to be soluble in alcohol gas. Cobaltous chloride remained in solution at 320° C., and continued to exhibit its characteristic blue colour. It even showed a spectrum identical with that shown at 15° C. The spectrum of the acid decomposition product of chlorophyll similarly dissolved in alcohol, gives identical spectra at 350° C., and 15° C., though in air it decomposes below 200° C.

Other experiments with sulphur, selenium, and arsenic in bisulphide of carbon gave interesting but less conclusive results. The question whether the critical point of a gas is altered by having a solid dissolved in it appears to be affirmatively decided; for the authors found that while the critical point of pure alcohol is 234°·6 C. at a pressure of that of 65 atmospheres, alcohol containing potassic iodide was 237° at a pressure of 71·1 atmospheres.

Further attempts were made to obtain solutions of sodium in ammonia, gas, and hydrogen, in the latter case with partial success.

As a final conclusion the authors claim that these experiments, made at temperatures much further removed from the critical point than those from which Andrews reasoned, afford further proof of the perfect continuity of the liquid and gaseous states, and also complete proof of the solubility of solids in gases.

THE LATE MR. THOMAS BELL, F.R.S.

TO few men does English biological science owe more than to the veteran zoologist whose death we briefly recorded in NATURE, vol. xxi. p. 473. Born at Poole, in Dorsetshire, on October 11, 1792, Thomas Bell was educated as a surgeon-dentist, and on his establishment in practice in London he soon gained a high professional reputation. From an early period of life he devoted his leisure hours to zoological studies, and the fruits of his careful and conscientious labours are preserved in his numerous contributions to the *Transactions* and *Proceedings* of the Linnean, Geological, and Zoological Societies, and in his well-known manuals on "British Quadrupeds," "Reptiles," and "Stalk-eyed Crustacea." These latter formed part of the series of works published by Mr. Van Voorst, which have done so much to spread a knowledge of the natural history of our islands; and Mr. Bell was specially adapted to such a task, having a happy faculty of conveying scientific information in such a form as to be attractive to the general reader. A still more important undertaking was his illustrated folio, "Monograph of the Testudinata," begun in 1836, but unfortunately the publisher failed when only eight parts had appeared; the plates, along with some which had remained unpublished, were re-issued to the public in 1872 by Mr. Sothern, with letterpress by the late Dr. J. E. Gray.

But the services which Mr. Bell rendered to science were far from being confined to his published writings. From 1848 to 1853 he was one of the secretaries of the Royal Society, of which he had been elected a Fellow in 1828, and his business habits, energy, and personal popularity enabled him greatly to advance its interests. On his resigning this secretaryship in 1853 he was elected President of the Linnean Society, of which body he had been a member since 1815. Neither the scientific standing nor the financial position of the Society were then in a state at all worthy of its name and traditions, and the new President set vigorously to work at its reform. By personal example and influence in procuring suitable papers and in assuring good attendances, by an active enlistment of new members, and a rigorous supervision of expenditure, and by generous private donations to the

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